

Comm 21.09 Smoke detectors.

(1) A listed and labeled multiple-station smoke alarm with battery backup shall be installed in all of the following locations:

- (a) An alarm shall be installed inside each sleeping room.
- (b) On floor levels that contain one or more sleeping areas, an alarm shall be installed outside of the sleeping rooms, in the vicinity of each sleeping area.
- (c) On floor levels that do not contain a sleeping area, an alarm shall be installed in a common area on each floor level.

Note 1: Section 50.035 (2), Stats., created by 1983 Wis. Act 363 requires the installation of a complete low voltage, interconnected or radio-transmitting smoke detection system in all community-based residential facilities including those having 8 or fewer beds.

Note 2: Section 101.645 (3), Stats., requires the owner of a dwelling to install a functional smoke detector in the basement of the dwelling and on each floor level except the attic or storage area of each dwelling unit. The occupant of such a dwelling unit shall maintain any smoke detector in that unit, except that if any occupant who is not the owner, or any state, county, city, village or town officer, agent or employee charged under statute or municipal ordinance with powers or duties involving inspection of real or personal property, gives written notice to the owner that the smoke detector is not functional the owner shall provide, within 5 days after receipt of that notice, any maintenance necessary to make that smoke detector functional.

Note 3: Section 101.745 (4), Stats., requires the manufacturer of a manufactured building to install a functional smoke detector in the basement of the dwelling and on each floor level except the attic or storage area of each dwelling unit.

Question: What does the "...in the vicinity of each sleeping area." mean?

Answer: A "sleeping area" can include several bedrooms not separated by another use.

Question: Are there other warning devices acceptable to the Department other than a listed detector?

Answer: Yes, an interconnected alarm or horn that is wired into the smoke detector system is acceptable since the Department concern is to wake sleeping inhabitants and not just smoke detection. The sound levels commonly accepted as able to wake a sleeping person is 75 dba at the pillow. Remember that the following sound loss deductions:

Sound Loss at 1000 HZs

<i>Stud Wall</i>	<i>41 db</i>
<i>Open Doorway</i>	<i>4 db</i>

<i>Typical Interior Door</i>	<i>11 db</i>
<i>Typical Fire Related Door</i>	<i>20 db</i>
<i>Typical Gasketed Door</i>	<i>24 db</i>

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(2) Smoke detectors required by this section shall be continuously powered by the house electrical service, and shall be interconnected so that activation of one detector will cause activation of all detectors.

(3) For family living units with one or more communicating split levels or open adjacent levels with less than one full story separation between levels, one smoke detector on the upper level shall suffice for an adjacent lower level, including basements. Where there is an intervening door between one level and the adjacent lower level, smoke detectors shall be installed on each level.

(4) Smoke alarms and detectors shall be maintained in accordance with the manufacturer's specifications.

(5) For envelope dwellings, at least 3 smoke alarms shall be placed in the air passageways. The alarms shall be placed as far apart as possible.

Smoke Detectors

Since the 1992 edition of the UDC, a requirement for interconnection and hardwired smoke detectors has been present. Where the 1989 edition permitted battery operated units, the 1992 edition mandated detectors to be powered by house electrical service. The 1992 edition also required activation of one detector to activate all detectors. Emergency, backup or battery backup power is not required for detectors.

Note that state statute s. 101.615 requires smoke detectors in pre-UDC (June 1, 1980) dwelling similar to the UDC requirements. Chapter Comm 28 codifies these requirements for older dwellings. You may order our brochure on state smoke detectors requirements using the order form at the front of this commentary.

Question: *If a contractor or owner wants to have additional smoke detectors over and above the minimum required by the Code, can they be battery-operated or must they be hard wired into the required system(s)?*

Answer: *Yes, if an owner wants a battery-operated smoke detector in every room or closet, they can do that.*

Question: *Should the smoke detectors be connected to a separate, dedicated circuit or can they be tied to any lighting or outlet circuit?*

Answer: *Unlike fire alarm systems in commercial applications, the Department's recommendation is to connect the smoke detectors to a common lighting circuit and be connected ahead of any local switches. That way, if the circuit breaker*

trips, the owner will be aware that his smoke detector and alarms are not operational because his hallway or kitchen (etc.) lights aren't working.

Comm 21.10 Protection against decay and termites.

(1) Wood used in any of the locations specified under this section shall meet both of the following requirements:

(a) The wood shall be pressure treated with preservative or shall be a naturally durable and decay-resistant species or shall be engineered to be decay resistant.

(b) The wood shall be pressure treated with preservative or shall be naturally termite-resistant unless additional steps are taken to make the wood termite-resistant.

(2) Wood used in the following locations shall be as required under sub. (1):

(a) Embedded in earth.

(b) Floor joists that span directly over and within 18 inches of earth.

(c) Girders that span directly over and within 12 inches of earth.

(d) Sills and rim joists that rest on concrete or masonry and are within 8 inches above exterior grade.

Protection Against Decay and Termites

Question: *Comm 21.10 – An interior wood frame wall is placed on a continuous concrete footing in the basement and is used in place of a beam for support of the floor system above. The top of the footing will be level with the basement floor. Does the sole plate of this wall have to be pressure treated with a preservative or be decay-resistant lumber?*

Answer: *Subsection Comm 21.10 (1)(g) states that wood used in basements for bearing walls shall comply. This is a bearing wall and, therefore, must comply.*

(e) Siding within 6 inches of earth.

(f) Ends of wood structural members built into masonry or concrete walls and having clearances of less than 1/2 inch on the top, sides and ends.

(g) Bottom plates of load bearing walls on slab floors in basements or garages.

(h) Bottom plates of garage walls that rest on concrete or masonry and are within 8 inches of exterior grade.

(i) Columns in direct contact with concrete or masonry unless supported by a structural pedestal or plinth block at least 3 inches above the floor.

(j) Any structural part of an outdoor deck, including the decking.

(3) Wood girders that rest directly on exterior concrete or masonry shall be protected by one of the following methods:

(a) The wood shall be pressure treated with preservative or shall be a naturally durable and decay-resistant species.

(b) Material, such as pressure-treated plywood, flashing material, steel shims, or water-resistant membrane material shall be placed between the wood and the concrete or masonry.

(4) IDENTIFICATION. (a) All pressure-treated wood and plywood shall be identified by a quality mark or certificate of inspection of an approved inspection agency which maintains continued supervision, testing and inspection over the quality of the product.

(b) Pressure treated wood used below grade in foundations shall be labeled to show conformance with AWPAC-22 "Lumber and Plywood for Permanent Wood Foundations - Preservative Treatment by Pressure Processes" and labeled by an inspection agency accredited by the American Lumber Standards Committee.

Note: Heartwood of redwood, cypress, black walnut, catalpa, chestnut, osage orange, red mulberry, white oak, or cedar lumber are considered by the department to be naturally decay-resistant. Heartwood of bald cypress, redwood, and eastern red cedar are considered by the department to be naturally termite resistant.

Comm 21.11 Foam plastic insulation.

(1) (a) General. Foam plastic insulation shall have a flame-spread rating of 75 or less and a smoke-developed rating of 450 or less when tested in accordance with ASTM E-84.

(b) Thermal barrier. Except as provided in par. (c), foam plastic shall be separated from the interior of the dwelling by one of the following thermal barriers:

1. 1/2-inch gypsum wallboard.
2. 1/2-inch nominal wood structural panel.
3. 3/4-inch sawn lumber with tongue-and-groove or lap joints.
4. 1-inch of masonry or concrete.

5. A product or material shown by an independent laboratory to limit the temperature rise on the unexposed surface to 250°F for 15 minutes when tested in accordance with ASTM E-119.

6. For doors only, sheet metal with a minimum thickness of 26 standard steel gauge or aluminum with a minimum thickness of 0.032-inch.

Note: Number 26 standard steel gauge is approximately equal to 0.018 inch.

(c) Exemptions from thermal barrier requirement. The following applications of foam plastic do not require a thermal barrier.

1. On overhead garage doors.
2. In the box sill of the basement or ground floor, above the bottom of the floor joists.

(2) Insulation that does not meet the requirements of this section may be approved by the department in accordance with s. Comm 20.18. Approval will be based on tests that evaluate materials or products representative of actual end-use applications.

Foam Plastic Insulation Protection

The department has been asked whether foam plastic sheathing located on the gable ends of an unoccupied attic must be directly covered with a thermal barrier. The foam plastic is required to be separated from the living space by a thermal barrier. In this case, if a thermal barrier is located on the ceiling, such as the interior gypsum drywall, the foam plastic is adequately separated from the living space and no direct protection is required.

We have also been asked if foam plastic on the interior of a crawlspace needs to be covered. If the crawlspace does not openly communicate with an adjacent basement or other living space, then the floor sheathing is adequate to separate the foam plastic from the rest of the dwelling. However, if the crawlspace adjoins a basement or other space so that there was free air flow between the two, then the foam must be covered.

Another question has been raised about the use of foam plastic insulation on the interior of return air ducts. Sections Comm 21.11 and 23.08 prohibit the placement of unprotected combustible foam plastic on the interior of supply and return air spaces. Comm 23.08(2)(a) requires ducts to be constructed of or lined with a noncombustible material. An exception is made for unlined wood joists or stud spaces. Therefore, combustible foam plastics located on the interior of duct spaces must be protected by a noncombustible 15-minute thermal barrier.

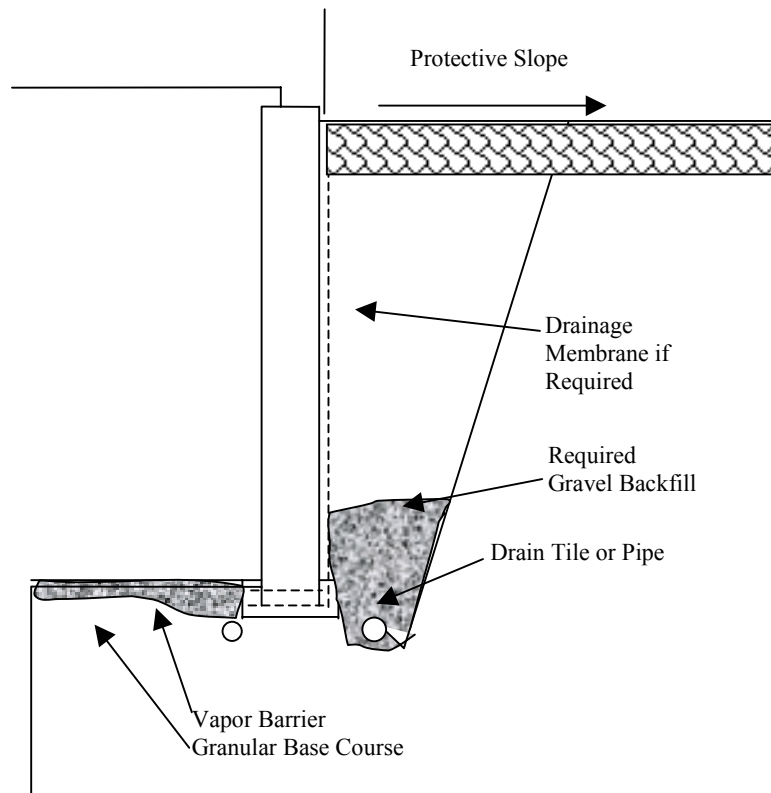
Finally it has been asked if foam insulation in attached garages needs to be protected. Yes it does because the requirement applies to any space where occupants may be present or to which they may be indirectly exposed.

An important exception to the protection requirement in the Celotex Thermax brand foam insulation which has received a Wisconsin Building Materials Approval (#950026-I) to be installed without protection. This is based on diversified testing that simulates actual fire conditions.

Subchapter III — Excavations

Comm 21.12 Grade.

The finished grade of the soil shall slope away from the dwelling at a rate of at least $\frac{1}{2}$ -inch per foot for a minimum distance of 10 feet, or to the lot line, whichever is less.



Comm 21.125 Erosion control procedures.

(1) PERFORMANCE STANDARDS. (a) General. Perimeter erosion control measures shall be placed within 24 hours after beginning the excavating. Erosion control measures shall be placed along downslope areas and along sideslope areas as required to prevent or reduce erosion where erosion during construction will result in a loss of soil to waters of the state, public sewer inlets or off-site. The best management practices as defined in s. Comm 20.07 (8m) or alternative measures that provide equivalent protection to these practices may be utilized to satisfy the requirements of this section. When the disturbed area is stabilized, the erosion control procedures may be removed.

(b) Stabilization by seeding and mulching. Slopes greater than or equal to 12%, with a downslope length of 10 feet or more, are not considered stabilized with seeding and mulching unless used in conjunction with a tackifier, netting, or matting. Asphalt emulsion may not be used as a tackifier.

(c) Tracking. Sediment tracked by construction equipment from a site onto a public or private paved road or sidewalk shall be minimized by providing a non-tracking access roadway. The access roadway shall be installed as approved on the plot plan, prior to framing above the first floor decking. The sediment cleanup provisions of par. (d) are unaffected by the presence or absence of an access roadway.

Note: It is not the intent of par. (c) to require a gravel access roadway where natural conditions, such as sandy soils or solidly frozen soil, already provide non-tracking access.

(d) Sediment cleanup. Off-site sediment deposition occurring as a result of a storm event shall be cleaned up by the end of the next work day following the occurrence. All other off-site sediment deposition occurring as a result of construction activities shall be cleaned up at the end of the work day.

(e) Public sewer inlet protection. Downslope, on-site public sewer inlets shall be protected with erosion control procedures.

(f) Building material waste disposal. All building material waste shall be properly managed and disposed of to prevent pollutants and debris from being carried off the site by runoff.

Note: For proper disposal of flammable, combustible and hazardous liquids, contact the local fire department.

(2) Best management practices. (a) General. Appropriate best management practices, as defined in s. Comm 20.07 (8m) or specified in chapter 3, Wisconsin Construction Site Best Management Practices Handbook, published by the department of natural resources, may be selected, installed, maintained and remain in place until the site is stabilized to meet the performance standards specified in sub. (1).

Note: The best management practices for slopes is covered under section B. 1, chapter 3, Wisconsin Construction Site Best Management Practices Handbook. For a reprint, see Table E-1 in Appendix E.

(b) Exceptions and clarification. All references to a model ordinance and planning considerations within chapter 3, Wisconsin Construction Site Best Management Practices Handbook, are not adopted by the department.

(3) MAINTENANCE OF EROSION CONTROL PROCEDURES. (a) General. During the period of construction at a site, all erosion control procedures necessary to meet the performance standards of this section shall be properly implemented, installed and maintained by the building permit applicant or subsequent landowner. If erosion occurs after building construction activities have ceased, some or all of the erosion control procedures shall be maintained until the site has been stabilized.

(b) Exceptions and clarification. The maintenance procedures and inspection sequences within chapter 3, Wisconsin Construction Site Best Management Practices Handbook, are not adopted as a part of this code.

Note: 1 The handbook is available from Document Sales, 202 South Thornton Avenue, P.O. Box 7840, Madison, Wisconsin 53707-8480; phone (608) 266-3358.

(4) DISMANTLING OF EROSION CONTROL PROCEDURES. Except for permanent erosion control systems, the owner shall be responsible for dismantling and removing erosion control procedures once the soil on the site is stabilized.

Note 2: For examples of acceptable erosion control maintenance procedures, see appendix.

*UNIFORM DWELLING CODE (UDC)
EROSION CONTROL*

Due to 1991 Wisconsin Act 309, effective December 1, 1992, section Comm 21.125 of the Uniform Dwelling Code (UDC) requires permit applicants to reduce the loss of soil off of new one- and two-family building sites. This section has five general areas to be addressed by the applicant - sideslope and downslope areas, vehicle tracking, sediment cleanup, sewer inlet protection, and building material waste disposal.

In order to properly address these areas, an applicant must, per s. Comm 21.125(2)(a), either comply with Chapter 3 (with some exceptions) of the Wisconsin Construction Site Best Management Practices Handbook (WCSBMPH) or other best management practices as determined by Department of Commerce per s. Comm 20.07(8m). Sections Comm 21.125(2)(b) and (3)(a) exclude those parts of the WCSBMPH dealing with the model ordinance, planning considerations, maintenance procedures and inspection sequences. The appendix to this code contains recommended maintenance procedures.

Although the Department of Commerce has not at this time determined any practices per s. Comm 20.07(8m) to be best management other than the WCSBMPH practices, s. Comm 21.125(1)(a) does allow alternative measures to 20.07(8m) if they provide equivalent protection. Therefore, the Department of Commerce grants municipal inspectors the authority to allow such alternative engineered measures on a site-by-site basis, similar to other performance code requirements.

Although the UDC only requires a reduction of off-site sedimentation to the extent affordable by the WCSBMPH practices, an applicant is still responsible per s. Comm 21.125(1)(c) for cleaning up any off-site sedimentation that breeches these practices.

While the UDC Appendix graphically reprints some of the WCSBMPH, there may be a need for the following excerpts, in citable format, of the Chapter 3 WCSBMPH practices as excluded or revised by the UDC and most often used on one- and two-family construction sites. These measures or alternative measures determined by municipal inspectors to be equivalent shall be used. Where larger disturbed areas or concentrated flows are involved, refer to the WCSBMPH itself for other measures.

Due to a lack of available research results, vegetative strips are not covered in the WCSBMPH. However, because they are defined as an erosion control procedure in the UDC, the Department of Commerce will conservatively accept them at this time. Vegetative barriers may be used as a perimeter measure if disturbed areas above consist of slopes no greater than 6 percent and barriers are on a grade no steeper than 5 percent. Vegetative barriers are to be a minimum of 10 feet wide for every 50 feet of open ground draining to them. These barriers must be maintained, i.e., not driven on or destroyed. If the barriers become covered with silt or otherwise destroyed, additional perimeter measures may be required.

SUBCHAPTER III EXCAVATIONS

Erosion Control

Statutes Applicable To Construction Site Erosion Control Enforcement

1. *Stats 101.653(2) Authorizes the Department of Commerce to promulgate UDC construction site erosion control rules. These rules are uniform statewide and supersede any municipal, including county, erosion control requirements applicable on individual building sites.*
2. *Stats 101.651 A UDC enforcing municipality may delegate erosion control enforcement, including legal prosecutorial followup, to a county that has adopted the UDC by ordinance. (Alternatively, as pointed out above per s. Comm 21.06(1)(a), a municipality may contract with the county to provide plan review and inspection services but retain legal prosecutorial followup.)*

Question: *Who will enforce the erosion control rules?*

Answer: *In UDC - enforcing municipalities (i.e., cities, villages, towns), the local building inspector will be responsible for the enforcement of erosion control standards. This enforcement could be delegated to counties adopting such authority by ordinance.*

Question: *What about existing municipal erosion control ordinances?*

Answer: *The portions of such ordinances addressing one- and two-family dwellings are superseded by the UDC.*

Question: *Do UDC enforcing municipalities need to change their UDC ordinance to include the erosion control rules?*

Answer: *No. Because the erosion control rules will be part of the UDC, it would be similar to any update of the UDC. Therefore, if you ordinance adopts the UDC in its entirety, it will also adopt the erosion control rules.*

Question: *How may municipalities and counties recover the costs of enforcement?*

Answer: *State statutes permit them to charge fees reasonable to recover their costs of plan review and inspection.*

Question: *Do inspectors need to be certified to perform erosion control inspections?*

Answer: *Yes. Inspectors have to be certified in the UDC-Construction category. The department has also created a special Restricted UDC-Construction category for existing soil erosion inspectors. An inspector certified in this category will be restricted to soil erosion inspections only. To receive a soil erosion inspector certification, an inspector will have to submit a completed*

certification application form to the Department of Commerce (see address below) which demonstrates that the inspector has attended an approved training session.

Question: *What will be done to ensure that communities enforce the erosion control rules?*

Answer: *The department is required by state statute to monitor all communities enforcing an erosion control ordinance a minimum of once every three years and to provide written reports for that monitoring.*

Question: *What forms should be used for erosion control enforcement?*

Answer: *Full UDC enforcing municipalities should use the uniform building permit application and permit card.*

Question: *What resource material or training is available for helping to determine compliance with erosion control standards?*

Answer: *The DNR Best Management Practice Handbook is an excellent source of reference material as is the revised UDC Appendix. The DNR Best Management Practice Handbook may be obtained from State Document Sales, 202 South Thornton Avenue, Madison, Wisconsin 53707 (call for price 1-800-362-7253). The UDC Appendix material will be distributed with the codebook insert pages.*

FILTER FABRIC FENCES

(C) Conditions Where Practice Applies

- (1) Downslope of disturbed areas where erosion is likely to occur in the form of sheet or rill erosion.*
- (3) Where the size of the drainage area is no more than 0.25 acres per 100 feet of fence length. The maximum slope length for given slopes is as follows:*

DISTANCE BETWEEN PARALLEL STRAW BALES OR SILT FENCE

<i>Slope Percent</i>	<i>Slope Distance (feet)</i>
<i>< 2%</i>	<i>100 feet</i>
<i>2 to 5%</i>	<i>75 feet</i>
<i>5 to 10%</i>	<i>50 feet</i>
<i>10 to 20%</i>	<i>25 feet</i>
<i>>20%</i>	<i>15 feet</i>

- (4) Where the maximum gradient behind the fence is 50 percent (2:1).*

- (5) *Under no circumstances may filter fabric fences be used in streams, swales, ditches or below ordinary high water marks along streams. See filter fabric barriers for conditions with concentrated flow.*

(E) Design Criteria and Requirements

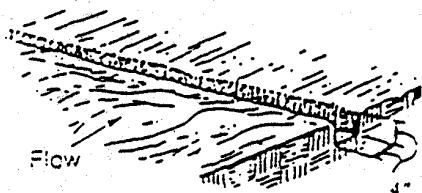
- (1) *Timing - Filter fabric fences shall be installed prior to disturbing the upslope area unless indicated otherwise on approved erosion control plan.*
- (2) *Removal - Filter fabric fences should be removed once the disturbed area is stabilized by permanent best management practices.*
- (3) *Placement - Silt fences shall be placed on the contour to the extent practicable. Silt fences may not be placed perpendicular to the contour on slopes of greater than 2 percent. Parallel fences may be used. The parallel spacing may not exceed the slope lengths for the appropriate slope specified above.*

The ends of the fence shall be turned upslope to prevent water from running around the ends of the fence. See Figure 1 on page B.1.4. (For fences using 24-inch silt fence fabric, the ends shall be upturned at least 16 inches in elevation. For silt fences using 36-inch fabric, the ends shall be upturned at least 28 inches in elevation.)

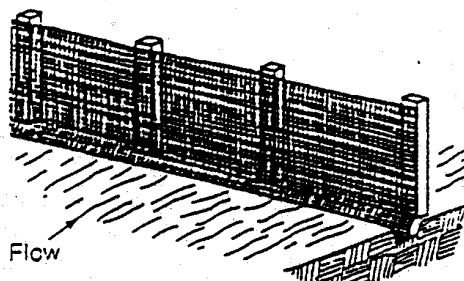
- (4) *Height - Installed silt fences shall be a minimum of 14 inches high and shall not exceed 28 inches in height. (The height requirement is measured from the ground surface to the top of the fence. This does not include the anchor material.) These height requirements are designed to accommodate 24- and 36-inch silt fence fabric.*
- (5) *Support - The full height of the silt fence shall be supported by 1 1/8" x 1 1/8" air or kiln dried posts of hickory, oak, or equivalent. The posts shall be 3 feet long for 24-inch silt fence fabric and 4 feet for 36-inch silt fence fabric. (At least 20 inches of the post shall extend into the ground after fence installation.) The silt fence fabric shall be stapled, using at least 0.5-inch staples, to the upslope side of the posts. The maximum spacing of posts for nonwoven silt fence shall be 3 feet. (No support cord is required for the 3-foot post spacing.) The maximum post spacing for nonwoven fabric with support net and top support cord, as specified below, or for woven fabric with support cord shall be 8 feet.*
- (6) *Anchoring - The silt fence fabric shall be anchored by spreading at least 8 inches of the fabric in a 4" x 4" trench or a 4-inch deep V-trench on the upslope side of the fence as shown in Figures 1 and 2. The trench shall be backfilled and compacted.*

How to Install a Silt Fence

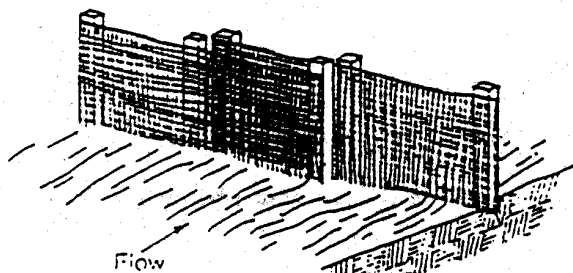
1. Excavate a 4" x 4" trench along the contour.



2. Stake the silt fence on downslope side of trench. Extend 8" of fabric into the trench.



3. When joints are necessary, overlap ends for the distance between two stakes.



4. Backfill and compact the excavated soil.

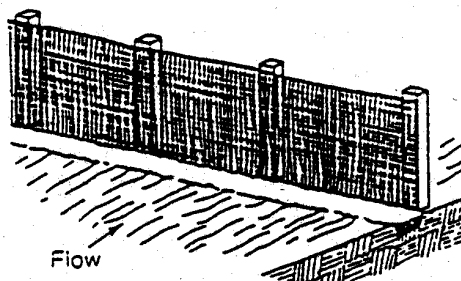
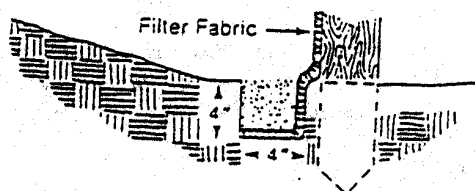
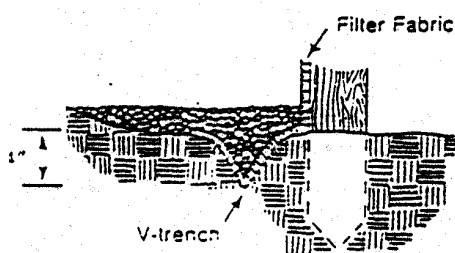


Figure E-2 Silt Fence Installation

Cross Sections of Trenches for Silt Fences



STRAW BALE FENCES

(A) Conditions Where Practice Applies

- (1) *Downslope of disturbed areas where erosion is likely to occur in the form of sheet or rill erosion.*
- (3) *Where the maximum size of the drainage area is 0.25 acres per 100 feet of fence length; the maximum length of slope behind the fence is 100 feet; and the maximum gradient behind the fence is 50 percent (2:1). The maximum slope length for given slopes is as follows:*

DISTANCE BETWEEN PARALLEL STRAW BALES OR SILT FENCE

Slope Percent	Slope Distance (feet)
< 2%	100 feet
2 to 5%	75 feet
5 to 10%	50 feet
10 to 20%	25 feet
>20%	15 feet

- (4) *Where pollutant control is needed for less than three months.*
- (5) *Under no circumstances may straw bale fences be used in streams, swales, ditches or below ordinary high water marks along streams. See straw bale barriers for conditions with concentrated flow.*

(B) Design Criteria and Construction Requirements

- (1) Timing - Straw bale fences shall be installed prior to disturbing the upslope area.
- (2) Removal - Straw bale fences may be removed once the disturbed area is stabilized by permanent best management practices.
- (3) Placement - Straw bale fences shall be placed on the contour to the extent practicable. Straw bale fences may not be placed perpendicular to the contour on slopes of greater than 2 percent. The ends of the straw bale fence should be turned upslope 1 to 2 feet in elevation to prevent flanking.
- (4) Entrenching - The straw bale fence shall be entrenched at least 4 inches. The upslope side of the bale shall be built up an additional 4 inches.
- (5) Abutting - Straw bale fences shall be constructed by tightly abutting ends of adjacent bales. Gaps between bales shall be filled with straw.

- (6) Positioning - All bales shall be either wire-bound or string-tied. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales to prevent degradation of the bindings.
- (7) Anchoring - Each straw bale shall be securely anchored by at least two stakes or re-bars driven through the bale and at least 8 inches into the ground. The first stake shall be driven towards the previously anchored bale to help create a tight fit.

MULCHING

(A) Definition

A soil surface application of plant residues or other suitable materials.

(B) Purposes

- (1) *To reduce erosion by dissipating raindrop impact energy and reducing overland flow and concentrated flow velocities.*
- (2) *To foster establishment of temporary vegetative cover.*
- (3) *To foster establishment of permanent vegetative cover.*

(C) Conditions Where Practice Applies

- (1) *On exposed soils where additional grading or landscaping will take place.*
- (2) *On exposed soils in conjunction with temporary or permanent seeding.*

(E) Design Criteria and Construction Requirements

- (2) Concentrated Flow Sites - Mulching in ditches, diversions, channels and other areas of concentrated flow shall meet the requirements of D.1. Permanent Channel Stabilization in the WCSBMPH.
- (3) Preparation - The area to be mulched shall be reasonably free of sticks, stones larger than 3 inches in diameter and rills and gullies.
- (4) Mulch -

a. Mulch shall be applied at the following rates:

	<u>Tons per Acre</u>	<u>Pounds per 1000 Square Feet</u>
Straw	1.5 - 2	70 - 90
Wood Chips	6 - 9	275 - 412
Wood Fiber	0.75 - 1	37 - 50

- (5) Nets and Mats - Erosion nets and mats including excelsior retention blankets, jute matting and polypropylene netting, shall be installed according to the manufacturer's recommendations.

(A) Purpose

- (B) Conditions Where Practice Applies*

- (C) Design Criteria and Requirements

- (1) Installation - Filter fabric barriers shall be installed:
 - a. Prior to disturbing upslope areas, or
 - b. Within 24 hours of constructing ditches, diversions or other channels.
- (2) Removal - Filter fabric barriers shall remain in place and be maintained until disturbed upslope areas and channels, ditches and diversions are stabilized by permanent best management practices.
- (3) Shape - The elevation of the barrier at the top of the filter fabric at the thread or invert location in the channel shall be lower than the bottom elevation of the ends of the barrier.
- (4) Height - Filter fabric barriers shall be at least 18 inches and may not be more than 36 inches in height.
- (5) Support - The full height of the filter fabric barrier shall be supported by 5-foot long, 4-inch diameter posts of equivalent and wire fence 42 inches in height. The posts shall be driven at least 12 inches into the ground. The maximum spacing of the posts shall be 10 feet. The wire fence shall be a minimum of 14 1/2 gauge and a maximum mesh spacing of 6 inches.
- (6) Attaching - The filter fabric and wire mesh shall be stapled or wired to the upslope of the wire mesh with heavy duty staples at least 1 inch long, wire ties or hog rings.

- (7) Entrenching - The filter fabric shall be anchored by spreading at least 8 inches of the fabric in a 4" x 4" trench on the upslope side of the barrier. The wire mesh shall extend at least 3 inches into the trench. The trench shall be backfilled and compacted.
- (8) Fabric Specifications - The filter fabric shall meet the specifications of the WCSBMPH.
- (9) Spacing - The spacing between fences shall be determined based on the drainage area and the difference in elevation. For unpaved contributing areas, the contributing drainage area to each filter fabric barrier may not exceed two acres. For paved contributing areas, the contributing drainage area to each filter fabric barrier may not exceed one acre. The difference in elevation between barriers may not exceed $\frac{2}{3}$ the height of the filter fabric. (For example, a foot barrier used on a 2 percent grade with an unpaved contributing area allows the barriers to be placed 100 feet apart provided the contributing area between the barriers does not exceed two acres.)

STRAW BALE BARRIER

(A) Purpose

- (1) To prevent channels from eroding by decreasing the velocity of low-to-moderate velocity and volume channel flows.

(B) Conditions Where Practice Applies

- (1) In unstabilized minor swales, ditches or diversions where the maximum contributing area is no greater than two acres.
- (2) Straw bale barriers may not be used in intermittent and perennial stream channels.

(C) Design Criteria and Requirements

- (1) Installation - Straw bale barriers shall be installed:
 - a. Prior to disturbing upslope areas, or
 - b. Within 24 hours of constructing ditches, diversions or other channels.
- (2) Removal - Straw bale barriers shall remain in place and be maintained until disturbed upslope areas and channels, ditches and diversions are stabilized by permanent best management practices.
- (3) Shape - To prevent flow around the barrier, the elevation of the top of the straw bale barrier at the thread of invert location in the channel shall be lower than the bottom elevation of the ends of the barrier as illustrated in Figure 1.

- (4) Positioning - Straw bales barriers shall be installed so that the bindings are oriented around the sides rather than along the tops and bottoms of the bales to prevent deterioration of the bindings. Gaps between bales shall be chinked (filled by wedging) with straw to prevent water from flowing between bales.
- (5) Anchoring - The straw bale shall be anchored by at least two stakes or re-bars driven through each bale. The first stake shall be driven towards the previously anchored bale to force the bales together. The stakes shall be driven deep enough to securely anchor the bale.
- (7) Entrenching - The straw bale fence shall be entrenched at least 4 inches. The upslope side of the bale shall be built up an additional 4 inches.
- (8) Spacing - The spacing between fences shall be determined based on the drainage area and the difference in elevation. For unpaved contributing areas, the contributing drainage area to each straw bale barrier may not exceed two acres. For paved contributing areas, the contributing drainage area to each straw bale barrier may not exceed one acre. The difference in elevation between barriers may not exceed $\frac{2}{3}$ the height of the straw bale. (For example, a 3-foot barrier used on a 2 percent grade with an unpaved contributing area allows the barriers to be placed 100 feet apart provided the contributing area between the barriers does not exceed two acres.)

TEMPORARY GRAVELED ACCESS ROADS

(A) Definition

- (1) A gravel stabilized pad located at points of vehicular access and parking on the construction site.

(B) Design Criteria and Requirements

- (1) Timing - The graveled access shall be installed as soon as practicable or no later than the time of backfill.
- (2) Removal - The graveled access shall remain in-place and be maintained until the disturbed area is stabilized by permanent best management practices.
- (3) Location - The graveled access shall be located to provide maximum use by all construction vehicles.
- (4) Dimensions - The graveled access should consist of at least 6 inches of 2- to 3-inch aggregate; 50 feet in length or the distance from the road to the specific construction area, whichever is less; and at least 7 feet in width. The width shall be 14 feet if it is necessary to have vehicles pass on the site.

Comm 21.13 Excavations adjacent to adjoining property.

(1) NOTICE. Any person making or causing an excavation which may affect the lateral soil support of adjoining property or buildings shall provide at least 30 days written notice to all owners of adjoining buildings of the intention to excavate. The notice shall state that adjoining buildings may require permanent protection.

(a) Exception. The 30-day time limit for written notification may be waived if such waiver is signed by the owner(s) of the adjoining properties.

(2) RESPONSIBILITY FOR UNDERPINNING AND FOUNDATION EXTENSIONS. (a) Excavations less than 12 feet in depth. If the excavation is made to a depth of 12 feet or less below grade, the person making or causing the excavation shall not be responsible for any necessary underpinning or extension of the foundations of any adjoining buildings.

(b) Excavations greater than 12 feet in depth. If the excavation is made to a depth in excess of 12 feet below grade, the owner(s) of adjoining buildings shall be responsible for any necessary underpinning or extension of the foundations of their buildings to a depth of 12 feet below grade. The person making or causing the excavation shall be responsible for any underpinning or extension of foundations below the depth of 12 feet below grade.

Comm 21.14 Excavations for footings and foundations.

(1) EXCAVATIONS BELOW FOOTINGS AND FOUNDATIONS. No excavation shall be made below the footing and foundation unless provisions are taken to prevent the collapse of the footing or foundation.

(2) EXCAVATIONS FOR FOOTINGS. All footings shall be located on undisturbed or compacted soil, free of organic material, unless the footings are reinforced to bridge poor soil conditions.

Subchapter IV — Footings**Comm 21.15 Footings.**

The dwelling shall be supported on a structural system designed to transmit and safely distribute the loads to the soil. The loads for determining the footing size shall include the weight of the live load, roof, walls, floors, pier or column, plus the weight of the structural system and the soil over the footing. Footings shall be sized to not exceed the allowable material stresses. The bearing area shall be at least equal to the area required to transfer the loads to the supporting soil without exceeding the bearing values of the soil.

(1) SIZE AND TYPE. Unless designed by structural analysis, unreinforced concrete footings shall comply with the following requirements:

(a) Continuous footings. The minimum width of the footing on each side of the foundation wall shall measure at least 4 inches wider than the wall. The footing depth shall be at least 8 inches nominal. Footing placed in unstable soil shall be formed. Lintels may be used in place of continuous footings when there is a change in footing elevation.

Note: Unstable soil includes soils which are unable to support themselves.

(b) Column or pier footing. The minimum width and length of column or pier footings shall measure at least 2 feet by 2 feet. The depth shall measure at least 12 inches nominal. The column shall be so placed as to provide equal projections on each side of the column.

(c) Trench footings. Footings poured integrally with the wall may be used when soil conditions permit. The minimum width shall be at least 8 inches nominal.

(d) Chimney and fireplace footings. Footing for chimneys or fireplaces shall extend at least 4 inches on each side of the chimney or fireplace. The minimum depth shall measure at least 12 inches nominal.

(e) Floating slabs. Any dwelling supported on a floating slab on grade shall be designed through structural analysis. Structures supported on floating slabs may not be physically attached to structures that are supported by footings that extend below the frost line unless an isolation joint is used between the structures.

(f) Deck footings. Decks attached to dwellings and detached decks which serve an exit shall be supported on a structural system designed to transmit and safely distribute the loads to the soil. Footings shall be sized to not exceed the allowable material stresses. The bearing area shall be at least equal to the area required to transfer the loads to the supporting soil without exceeding the bearing values of the soil.

Question: *Are there conditions when a drilled or hand-dug pier foundation could be used in lieu of a 24" x 24" x 12" footing and concrete formed column be used and still comply with the UDC?*

Answer: *Yes, many times the deck loads transferred to deck piers are relatively small and these loads could be carried by the minimum soil bearing capacity (2000 psf) without a separate footing. As an example, a 10" round concrete pier poured on 2000 psf soil could carry a concentrated deck load of 1090 pounds per pier. Therefore if you know your deck loading information you can determine the center to center locations needed for the deck.*

Deck Column Footing Size

Deck footings are required to be designed with a bearing area equal or greater than the area required to transfer live and dead loads to the supporting soil without exceeding the bearing value of the soil. In lieu of a designed footing, the code required minimum size or a column footing of 24" x 24" x 12" thick should be used in accordance with Comm 21.15(1)(b). In designing a column footing for a deck, the following steps should be utilized:

- 1) Calculate the tributary area for floor and any roof area that the column carries.*

- 2) *Multiply the floor area by the code required live load and actual dead loads. Do the same for any roof area.*
- 3) *Divide the total load from 2) by the allowable soil bearing value listed in the Table at the end of s. Comm 21.15(2) to find the minimum footing size in square feet.*
- 4) *To provide adequate spread of the load through the concrete or gravel footer, its thickness should be at least one-half of its diameter, but in no case less than 8".*

(2) **SOIL-BEARING CAPACITY.** No footing or foundation shall be placed on soil with a bearing capacity of less than 2,000 pounds per square foot unless the footing or foundation has been designed through structural analysis. The soil-bearing values of common soils may be determined through soil identification.

Note: The department will accept the soil-bearing values for the types of soil listed in the following table:

Type of Soil	PSF
1. Wet, soft clay; very loose silt; silty clay	2,000
2. Loose, fine sand; medium clay; loose sandy clay soils	2,000
3. Stiff clay; firm inorganic silt.....	3,000
4. Medium (firm) sand; loose sandy gravel; firm sandy clay soils; hard dry clay.....	4,000
5. Dense sand and gravel; very compact mixture of clay, sand and gravel	6,000
6. Rock	12,000

(a) **Minimum soil-bearing values.** If the soil located directly under a footing or foundation overlies a layer of soil having a smaller allowable bearing value, the smaller soil-bearing value shall be used.

(b) **Unprepared fill material, organic material.** No footing or foundation shall be placed upon unprepared fill material, organic soil, alluvial soil or mud unless the load will be supported. When requested, soil data shall be provided.

Note: The decomposition of organic material in landfill sites established for the disposal of organic wastes may produce odorous, toxic and explosive concentrations of gas which may seep into buildings through storm sewers and similar underground utilities unless provisions are taken to release the gases to the atmosphere.

Comm 21.16 Frost penetration.

(1) **GENERAL.** Footings and foundations, including those for ramps and stoops, shall be placed below the frost penetration level, but in no case less than 48 inches below grade measured adjacent to the footing or foundation. Footings shall not be placed over frozen material.

(2) **EXCEPTIONS.** (a) Floating slabs constructed on grade need not be installed below the minimum frost penetration line provided measures have been taken to prevent frost forces from damaging the structure.

(b) Grade beams need not be installed to the minimum frost penetration line provided measures are taken to prevent frost forces from damaging the structure.

(c) Stoops or ramps need not be installed below the minimum frost penetration level provided measures are taken to prevent frost forces from damaging the structure.

(d) Footings or foundations may bear directly on rock located less than 48 inches below grade. Prior to placement, the rock shall be cleaned of all earth. All clay in the crevices of the rock shall be removed to the level of frost penetration or 1-1/2 times the width of the rock crevice. Provisions shall be taken at grade to prevent rain water from collecting along the foundation wall of the building.

(e) Portions of footings or foundations which are located directly below window areaways which are required to be installed in accordance with s. Comm 21.03 (6m), are exempt from the requirements of sub. (1).

Frost Penetration

Question: *How does one determine if the local frost penetration is greater than the 48-inch minimum requirement by code?*

Answer: *In most cases, you will find that the average frost depth does not exceed the 48-inch depth. A good source for the average local conditions of frost is to check with the people involved with the installation of utilities or grave digging.*

Exception to Frost Penetration Rule

This section generally requires a 48-inch footing depth to prevent frost damage. There are some exceptions to allow lesser footing depths provided measures are taken to prevent frost heave damage to the structure.

Some measures which may be considered to help prevent damage, if over and above the code minimum requirements, include:

- *Verification of good soils (well-drained, granular) which may be less subject to retaining water which may freeze and expand.*
- *Additional drainage at the affected footing in conjunction with good surface drainage.*
- *Providing reinforcement in the affected footing and/or foundation wall.*
- *Providing reinforced perimeter grade beams in slab-on-grade construction.*
- *Providing a mechanical tie or continuous reinforcement to bind the stoops or ramps to the foundation wall to resist relative movement. This would help prevent obstruction of exit doors or gaps at the wall to stoop interface.*

- *Overdesigning the foundation or structure to recognize the potential for some soil-caused deflection.*
- *Insulate the soil around the building perimeter with foam board laid horizontally just below the ground surface – see Chapter 22 and Appendix.*

Most times a qualified engineer should make the determination which of the above, or other, measures is inherent in the situation or may be required to gain code compliance. The engineer's report should be submitted to the local inspector for approval.

Question: *Are frost-protected footings allowed and what standards must be followed in the construction of footings or slabs-on-grade without going below frost levels?*

Answer: *Yes. Frost-protected footings are allowed. Frost-protected footings (FPF) is an internationally recognized and accepted technique of protecting slab-on-grade foundations of heated buildings against frost action. The FPFs use rigid horizontal perimeter insulation to reduce heat loss from the ground around the dwelling. This heat keeps the ground from freezing and frost action on the structure. The FPFs have been used in Scandinavian countries since the 1950s and more recently in the United States. At this time the department accepts FPFs installed in accordance with those designs that assume the building is unheated. This is a conservative design that allows for the possibility of the dwelling being unoccupied and unheated during some winters of the dwelling's lifetime. See UDC Appendix.*

Comm 21.17 Drain tiles.

(1) DETERMINATION OF NEED. (a) New construction. 1. Except as provided under sub. (2), a complete drain tile or pipe system shall be installed around the foundation of dwellings under construction where groundwater occurs above the bottom of the footing.

2. For the purposes of this section, a complete drain tile or pipe system includes the drain tile or pipe installed inside and outside the foundation at the footing level, bleeders connecting the inside tile or pipe to the outside tile or pipe, the sump pit, the discharge piping, and a pump or means of discharging water to natural grade.

(b) Optional systems. 1. If a complete drain tile or pipe system is not required by natural conditions under par. (a) or by a municipality exercising jurisdiction under sub. (2) (a), a partial drain tile or pipe system may be installed.

2. For the purposes of this section, a partial drain tile or pipe system may include any of the elements under par. (a) 2.

(2) Municipalities exercising jurisdiction. (a) New construction. 1. For new dwelling construction, a municipality exercising jurisdiction under this code may determine the soil types and natural or seasonal groundwater levels for which a complete drain tile or pipe system is required.

2. For new dwelling construction, a municipality may not enact requirements for other than complete drain tile or pipe systems.

(b) Alterations to an existing dwelling. For an alteration to an existing dwelling covered by this code, a municipality may not require a complete drain tile or pipe system.

(c) Partial systems. Municipalities may allow partial drain tile or pipe systems for new dwellings under construction or existing dwellings.

Determination of Drain Tiles Need

Where municipalities exercise jurisdiction over requiring drain tile within their community, they should provide sufficient notice to the building permit applicant by indicating to the applicant at the time that the plans are approved how the municipality handles enforcement of drain tile. This means that the municipality, plan reviewer, or inspector should at the time the plans are approved indicate whether or not the community will require drain tile to be provided with Comm 21.17, not require drain tile to be provided, or will make a determination as to whether or not drain tile will be required upon an inspection visit to the excavated site. This allows the communities to either have a blanket policy of a requirement or nonrequirement for drain tile, and still allows them the flexibility to make that determination upon viewing the excavation, wherein they can determine soil types and sometimes water elevation. It is the department's position that for the drain tile requirement, the decision should be made as early on in the permit, plan review, inspection process as possible.

TABLE 1
TYPES OF SOILS AND THEIR DESIGN PROPERTIES

Soil Group	Unified Soil Classification System Symbol	Soil Description	Allowable Bearing in Pounds Per Square Foot with Medium Compaction or Stiffness ⁴	Drainage Characteristics ²	Front Heave Potential	Volume Change Potential Expansion
Group I Excellent	GW	Well-graded gravels, gravel sand mixtures, little or no fines.	8000	Good	Low	Low
	GP	Poorly-graded gravels or gravel sand mixtures, little or no fines.	8000	Good	Low	Low
	SW	Well-graded sands, gravelly sands, little or no fines.	6000	Good	Low	Low
	SP	Poorly-graded sands or gravelly sands, little or no fines.	5000	Good	Low	Low
	GM	Silty gravels, gravel-sand-silt mixtures.	4000	Good	Medium	Low
	SM	Silty sand, sand-silt mixtures.	4000	Good	Medium	Low
Group II Fair to Good	GC	Clayey gravels, gravel-sand-clay mixtures.	4000	Medium	Medium	Low
	SC	Clayey sands, sand-clay mixtures.	4000	Medium	medium	Low
	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	2000	Medium	High	Low
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sand clays, silty clays, lean clays	2000	Medium	Medium	Medium ¹ to Low
Group III	CH	Inorganic clays of high plasticity, fat clays	2000	Poor	Medium	High ¹
	MH	Inorganic silts,	2000	Poor	High	High

Poor		micaceous or distomaceous fine sandy or silty soils, elastic silts.				
Group IV Unsatisfactory	OL	Organic silts and organic silty clays of low plasticity.	400	Poor	Medium	Medium
	OH	Organic clays of medium to high plasticity, organic silts.	-0-	Unsatisfactory	Medium	High
	P _t	Peat and other highly organic soils.	-0-	Unsatisfactory	Medium	High

- ¹ *Dangerous expansion might occur if these two soil types are dry but subject to future wetting.*
- ² *The percolation rate for good drainage is over 4 inches per hour, medium drainage is 2 to 4 inches per hour, and poor is less than 2 inches per hour.*
- ³ *Building code allowable bearing values may differ from those tabulated.*
- ⁴ *Allowable bearing value may be increased 25 percent for very compact, coarse grained gravelly or sandy soils or very stiff fine-grained clayey or silty soils. Allowable bearing value shall be decreased 25 percent for loose, coarse-grained gravelly or sandy soils, or soft, fine-grained clayey or silty soils. To determine compactness or stiffness to estimate allowable bearing capacity, measure the number of blows required to drive a 2-inch outside diameter, 1.375-inch inside diameter split-barrel sampler 1 foot into the soil by dropping a 140-pound hammer through a distance of 30 inches.*

In response to questions and concerns regarding work continuing after an inspection has not been carried out after the 48-hour requirement, municipalities and inspectors should inform the builder or owner that they are proceeding at their own risk, and at the time the municipality or inspector makes the inspection they may still require the drain tile to be provided in accordance with Comm 21.17.

A municipality may use various criteria other than a soil test report (per s. Comm 21.17(1)(b)) to determine where drain tile systems are required. Such criteria may include county soil maps, direct observation of standing water in the excavation, and experience with other sites in the locality. There is substantial discretion given to the local inspector. It is recommended that the criteria for this local discretion, or municipal policy, be uniformly applied within the municipality and expressed to builders before construction.

Where no local inspector is provided by the municipality, the code requires the owner and builder to install drain tiles where a soil test indicates periodic or seasonal groundwater at the footing. Often times such homes are also in unsewered areas. The soil test report for a private sewage system will indicate depth to seasonal groundwater. This report may be used to determine dwelling drain tile requirements if the house site is close to and is similar in soil and drainage characteristics to the private sewage system site.

If a private sewage system soils report is not available or applicable, then the owner or builder may retain a qualified soils consultant (engineer, certified soil tester) to determine groundwater depth or rely on the experience of other projects in the area, if relevant.

(3) MATERIALS AND INSTALLATION REQUIREMENTS FOR REQUIRED SYSTEMS. (a) General. Complete drain tile or pipe systems required by natural conditions under sub. (1) (a) or by a municipality exercising jurisdiction under sub. (2) (a) shall comply with the requirements of this subsection.

(b) Basement floor slabs. The basement slab shall be placed on at least 4 inches of clean graded sand, gravel or crushed stone.

(c) Manufactured drainage systems. Manufactured drainage systems not meeting the requirements of this section shall be submitted to the department for review and approval prior to installation.

(d) Drain tile or pipe installation. Drain tile or pipe used for foundation drainage shall comply with the following requirements:

1. Drain tile or pipe shall have an inside diameter of at least 3 inches.
2. Drain tile or pipe shall have open seams, joints, or perforations to allow water to enter.
3. Where individual tiles are used, they shall be laid with 1/8 inch open joints. Joints between tiles shall be covered with a strip of sphalt or tar impregnated felt.
4. The tile or pipe shall be placed upon at least 2 inches of coarse aggregate and shall be covered on the top and the side facing away from the dwelling with a least 12 inches of coarse aggregate that meets all of the following criteria:
 - a. 100% of the aggregate shall pass a 1-inch sieve.
 - b. 90-100% of the aggregate shall pass a 3/4-inch sieve.
 - c. 0-55% of the aggregate shall pass a 3/8-inch sieve.
 - d. 0-5% of the aggregate shall pass a #8 sieve.

Note 1: A #8 sieve has square openings of 2.36 mm or 0.09 inch.

Note 2: These specifications encompass aggregate sizes #6 and #67 per ASTM standard C33. Of the two sizes, #6 is coarser.

5. Bleeder tiles or pipes shall be provided at no more than 8-foot intervals to connect the exterior drain tile or pipe to the interior drain tile or pipe.

Question: Are bleeder tiles required to connect interior and exterior drain tile?

Answer: Yes. Comm 21.17(3)(d) 5. requires bleeder tiles to connect to interior and exterior drain tile. The drain tile may be provided with a tee for connection or cut, NOT just butted together, to fit to the bleeder. In either case, the intent is to permit the free flow of water once it has reached the exterior drain tile thereby reducing any hydraulic pressure at the footing, foundation wall and basement slab.

6. The drain tiles or pipe that lead from the footing tiles to the sump pit shall be laid at a grade of at least 1/8 inch per foot leading to the sump pit. The remaining drain tiles or pipe shall be level or graded downward to the line leading to the sump pit.

Question: *If a drain tile “sock” is used, can I eliminate some or all of the coarse aggregate?*

Answer: *No, the tile “sock” doesn’t replace any of the coarse aggregates function and therefore, if used, is only an added safe guard against fines clogging the tile weeps. With some types of soils the “sock” actually hold certain types of fines and can cause basement water problems, so it is not recommended to use this type of ‘socked’*

Question: *What is the proper location for drain tile at the footing or on the footing?*

Answer: *Drain tile is to be placed AT the footing level, not setting on the footing, as the code is specific in Comm 21.17 (3)(d) 4. that the tile must set on 2 inches of coarse aggregate and be covered with at least 12 inches of coarse aggregate.*

Question: *The code talks about the placement of drain tile on 2 inches of coarse aggregate and being covered with 12 inches of coarse aggregate; but how much coarse aggregate is to be placed on the side of the tile?*

Answer: *As the code states “covered with at least 12 inches of coarse aggregate,” this includes the outside or side exposed to earth of the tile as well as the top. Normally since one side of the tile (connected to the bleeders) is up against the footing, only the top and side needs the 12 inches of cover.*

Drain Tiles - Materials and Installation Requirements

A properly functioning drain tile system will lower the water table (seasonal or longer term) to the level of the tile installation in the immediate vicinity of the foundation wall.

This is important not only to achieve a relatively dry basement, but to maintain the structural integrity of the home. A saturated soil is not only heavier than dry soil, but it also has less internal soil friction that normally helps restrain lateral soil flow. Therefore, the potential lateral pressures exhibited by saturated soils are significantly greater than well-drained foundation backfill. Also a well-drained soil is less likely to frost heave when frozen.

The tile, backfill, and discharge (sump) systems are designed to maximize drainage and minimize potential siltation and overload of the system. A well-graded gravel bed and porous backfill are important for proper drain system operation. Also, per s. Comm 21.12, the grade around the dwelling should slope away to minimize the need for the drain tile to handle surface water surcharge.

This office has received some complaints about sump pump systems operating continuously. Contrary to the complainant's concerns, this is usually evidence of a properly functioning system. The real problem is that groundwater in the area is at a relatively shallow depth, local soils are porous, or both. This results in a high volume of flow. These are conditions

that should have been considered in making the decision where to site the building by the owner and builder.

Such situations normally occur in lowland areas, where water tables are perched above poor drainage strata, where surface drainage is bad, or where soils are very porous (fractured limestone, gravels, some sand) that allow easy lateral soil water movement. Zoning laws and subdivision ordinances more appropriately regulate whether certain parcels of land should be developed and/or what floor elevation is required given these conditions. However, zoning codes may not further regulate construction of the foundation drainage systems.

(e) Drain tile or pipe discharge. 1. Drain tiles or pipe shall be connected to the sump pit.

2. The sump pit shall discharge to natural grade or be equipped with a pump.

Care should be taken not to allow sump discharge to cause erosion which would result in sediment being deposited off site.

3. All other aspects of drain tile discharge shall be in accordance with the uniform plumbing code, chs. Comm 82 to 87.

Note: The following is a reprint of the pertinent sections of the plumbing code.

Comm 82.36 (11) SUMPS AND PUMPS. (a) Sumps. 1. General. All storm building subdrains shall discharge into a sump, the contents of which shall be automatically lifted and discharged into the storm drain system.

2. Construction and installation. a. Except as specified in subd. 2. b., the sump shall have a rim extending at least one inch above the floor immediately adjacent to the sump. The sump shall have a removable cover of sufficient strength for anticipated loads. The sump shall have a solid bottom.

b. Where the sump is installed in an exterior meter pit or elevator pit, the rim shall be level with the floor.

3. Location. All sumps installed for the purpose of receiving clear water, basement or foundation drainage water shall be located at least 15 feet from any water well.

4. Size. The size of each clear water sump shall be as recommended by the sump pump manufacturer, but may not be smaller than 16 inches in diameter at the top, 14 inches in diameter at the bottom, and 22 inches in depth.

5. Removable covers. a. Except as specified in subd. 5. b., penetrations through the top of removable sump covers shall be limited to those for the electrical supply, the vent piping and the discharge piping for the pump or pumps.

b. A sump installed in an exterior meter pit or an elevator pit may be provided with an open grate cover.

Note: In accordance with s. Comm 18.21, a sump may not be located in an elevator machine room.

(b) Sump pump systems. 1. Pump size. The pump shall have a capacity appropriate for anticipated use.

2. Discharge piping. Where a sump discharges into a storm building drain or sewer, a free flow check valve shall be installed.

Comm 82.36 (3) DISPOSAL. (a) Storm sewer. Storm water, surface water, groundwater and clear water wastes shall be discharged to a storm sewer system or a combined sanitary-storm sewer system where available. Combined public sanitary-storm sewer systems shall be approved by the department of natural resources. Combined private sanitary-storm sewer systems shall be approved by the department.

(b) Other disposal methods. 1. Where no storm sewer system or combined sanitary-storm sewer system is available or adequate to receive the anticipated load, the final disposal of the storm water, surface water, groundwater or clear water wastes shall be discharged in accordance with local governmental requirements. If the final disposal of such waters or wastes is by means of subsurface discharge, documentation shall be submitted to this department to determine whether the method of disposal is acceptable.

2. Where approved by the local governmental authority, storm water, surface water, groundwater and clear water wastes of the properties of one- and 2-family dwellings may be discharged onto flat areas, such as streets or lawns, so long as the water flows away from the buildings and does not create a nuisance.

3. The waste from a drinking fountain, water heater relief valve, storage tank relief valve, water softener, or iron filter shall be discharged to a sanitary drain system or a storm drain system.

Note: See also s. NR 811.29 for setbacks to wells.

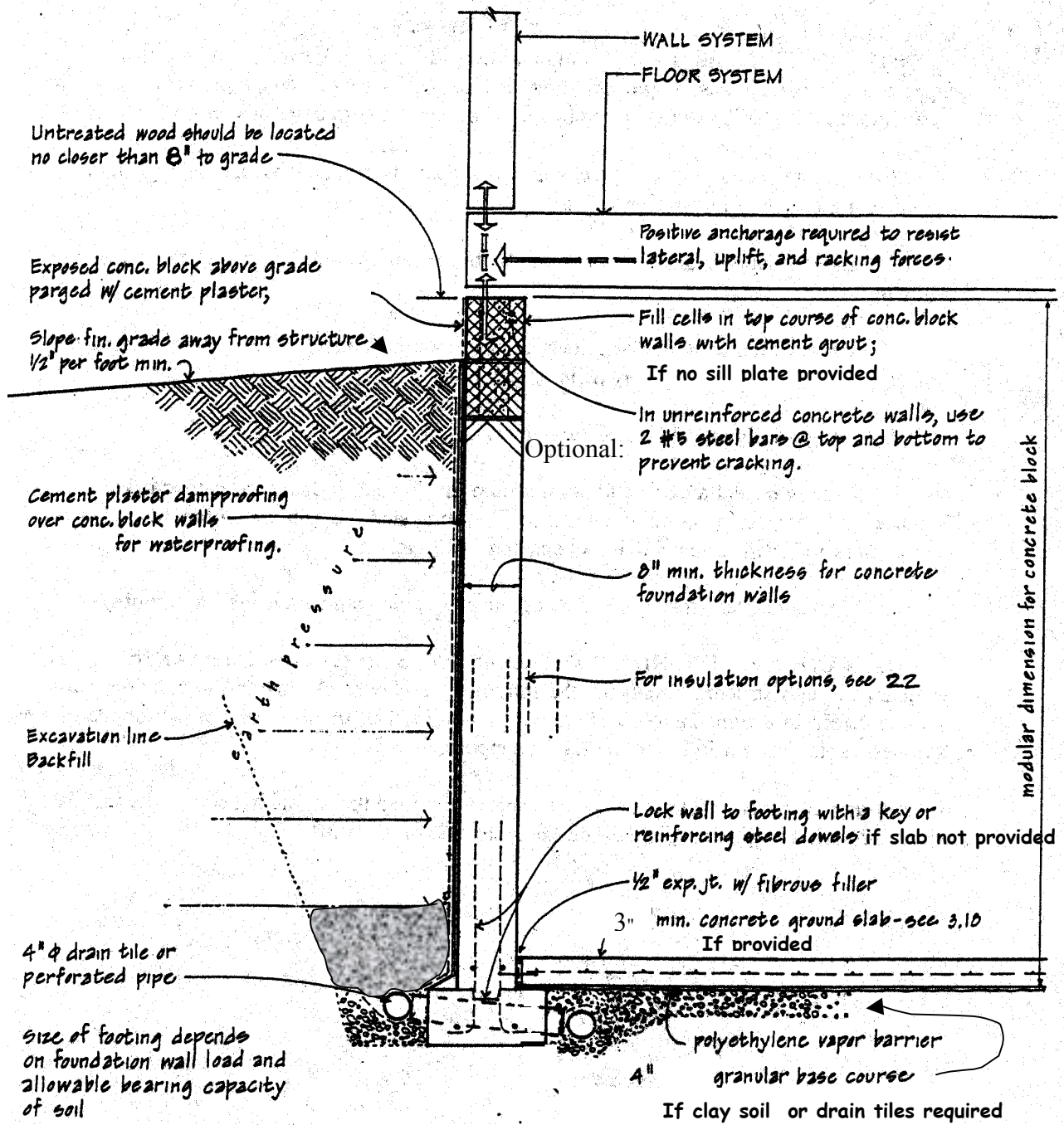
4. The clear water wastes from equipment other than those listed in subd. 3. may be discharged to a sanitary drain system which connects to a publicly owned treatment works, if not more than 20 gallons of clear water wastes per day per building are discharged.

5. The wastes from a floor drain located in a municipal well pump house, a water testing sink within a municipal well pump house or a one- and 2-family garage shall be discharged to a sanitary drain system or to ground surface.

(c) Segregation of wastes. 1. a. Except as provided in subd. 1. b., where a sanitary sewer system and a storm sewer system are available the drain piping for storm water or clear water wastes may not connect to any part of the sanitary drain system.

b. Where a combined sanitary-storm sewer system is available storm water wastes, clear water wastes and sanitary wastes may not be combined until discharging to the building sewer.

2. Storm water wastes and clear water wastes shall not be combined until discharging into the storm building drain.



FOUNDATION WALL SECTION

Subchapter V — Foundations

Comm 21.18 Foundations.

(1) GENERAL. (a) Design. Foundation walls shall be designed and constructed to support the vertical loads of the dwelling, lateral soil pressure, and other loads without exceeding the allowable stresses of the materials of which the foundations are constructed.

(b) Lateral support at base. Lateral support such as floor slabs or framing shall be provided at the base of foundation walls.

(c) Lateral support at top. Lateral support shall be provided at the top of the foundation walls by one of the following:

2. 'Structural analysis.' A system designed through structural analysis.

3. 'Anchor bolts.' a. Structural steel anchor bolts, at least 1/2 inch in diameter, embedded at least 7 inches into the grouted masonry with a maximum spacing of 72 inches and located within 18 inches of wall corners.

b. A properly sized nut and washer shall be tightened on each bolt to the plate or sill.

c. When vertical-reinforcing steel is provided in masonry construction, as required under sub. (3), the location requirements under subd. 3. a. shall be modified as necessary so anchor bolts are placed in the same core as the reinforcement without exceeding the limits of subd. 3. a.

4. 'Other mechanical fasteners.' a. Mechanical fasteners used in accordance with the manufacturer's testing and listing.

b. When vertical-reinforcing steel is provided in masonry construction, as required under sub. (3), the location requirements under subd. 4. a. shall be modified as necessary so the fasteners are placed in the same core as the reinforcement without exceeding the limits of subd. 4. a.

(d) Floor framing. 1. Floor framing shall be fastened to the sill plate by one of the following methods:

a. Mechanical fasteners used in accordance with the manufacturer's testing and listing.

b. In accordance with structural analysis.

c. In accordance with the fastener table printed in the appendix to this code.

2. a. Where the floor framing is parallel to the foundation wall, solid blocking or bridging shall be installed in at least the first adjacent joist space at a spacing of no more than 32 inches on center.

- b. Solid blocking shall be of the same depth as the joist.
- c. Fastening of the blocking or bridging shall be in accordance with structural analysis or the fastener table printed in the appendix to this code.
- (e) Soil lateral load. Unless designed through structural analysis, soil lateral loads shall be determined from Table 21.18-A.